

**IN THE CLAIMS:**

1        1. (Currently Amended) A method for programming a pattern matching engine  
2 having a plurality of information storage entries with one or more regular expressions,  
3 each regular expression including a plurality of characters and having each regular ex-  
4 pression defining a corresponding action to be applied to when matching strings are  
5 found, the method comprising the steps of:

6              identifying one or more borders within a given-regular expression, the one or  
7 more borders separating the given-regular expression into a plurality of sub-expressions,  
8 at least one sub-expression having a plurality of sequential characters; and

9              loading one or more entries of the pattern matching engine with a plurality of the  
10 sequential characters from at least more than one sub-expression, wherein the borders are  
11 defined by a predetermined sequence of regular expression metacharacters, the entries  
12 stored in content addressable memory (CAM) and  
13 determining if the plurality of sequential characters from more than one sub-  
14 expression matches a string, and if so, then  
15 executing the corresponding action associated with that matched string.

1        2. (currently amended) The method of claim 1 wherein the predetermined se-  
2 quence of regular expression metacharacters is a first regular expression metacharacter  
3 defined to match any one character followed immediately by a second regular expression  
4 metacharacter defined to match the preceding one character zero, one, or more times.

1        3. (currently amended) The method of claim 1 further comprising thea step of or-  
2 ganizing at least part of the pattern matching engine into a plurality of sections, and  
3 wherein each section of the pattern matching engine is loaded with a plurality of search  
4 patterns for a corresponding sub-expression.

1       4. (currently amended) The method of claim 3 wherein the entries of a ~~given~~-sec-  
2       tion are loaded with a search pattern that includes a complete match of ~~the~~a respective  
3       sub-expression, a search pattern that includes a partial match of ~~the~~a respective sub-  
4       expression, and a mismatch pattern.

1       5. (currently amended) The method of claim 4 further comprising the steps of:  
2              associating at least one sub-expression with a current state variable; and  
3              loading the associated current state variable into each entry of ~~the~~a section of the  
4       pattern matching engine that contains the at least one sub-expression.

1       6. (Original) The method of claim 5 wherein the pattern matching engine has at  
2       least one content addressable memory (CAM) loaded with the one or more regular ex-  
3       pressions.

1       7. (currently amended) The method of claim 6 wherein  
2              the CAM is a ternary content addressable memory, a TCAM, that supports don't  
3       care values, and  
4              each regular expressions loaded to the CAM ~~is loaded as~~has a plurality of search  
5       patterns including a mismatch pattern having all don't care values.

1       8. (currently amended) A method for programming a pattern matching engine  
2       having a plurality of information storage entries with one or more regular expressions,  
3       each regular expression including a plurality of characters and ~~having~~each regular ex-  
4       pression defining a corresponding action to be applied ~~to~~when matching strings are  
5       found, the method comprising the steps of:

6 identifying one or more borders within a ~~given~~ regular expression, the one or  
7 more borders separating the given regular expression into a plurality of sub-expressions  
8 wherein at least one sub-expression has a plurality of sequential characters;  
9 defining one or more search patterns for each sub-expression having one or more  
10 borders containing a predetermined sequence of regular expression metacharacters, the  
11 predetermined sequence of regular expression metacharacters containing a first regular  
12 expression metacharacter defined to match any one character followed immediately by a  
13 second regular expression metacharacter defined to match the ~~preceding~~one character  
14 zero, one, or more times;  
15 including at the pattern matching engine at least one ternary content addressable  
16 memory (TCAM) for loading one or more regular expressions and supporting don't care  
17 values, and a second memory device having a plurality of entries for loading actions cor-  
18 responding to the one or more regular expressions;  
19 organizing at least part of the TCAM into a plurality of sections wherein each sec-  
20 tion of the TCAM is loaded with a plurality of search patterns for a sub-expression, the  
21 plurality of search patterns includes a complete match pattern of ~~the respective~~a sub-  
22 expression, a partial match pattern of the respective sub-expression, and a mismatch pat-  
23 tern including all don't care values,  
24 determining if the plurality of sequential characters from more than one sub-  
25 expression matches a string, and if so, then  
26 executing the corresponding action associated with that matched string.

1        9. (Original) The method of claim 8 wherein each entry of the TCAM identifies a  
2        corresponding entry of the second memory device.

1        10. (currently amended) The method of claim 9 wherein at least one TCAM entry  
2        is associated with a next state variable, the method further comprising the step of loading  
3        the an entry of the second memory device that is identified by the at least one TCAM  
4        entry with the associated next state variable.

1        11. (currently amended) The method of claim 10 wherein  
2              the at least one TCAM entry is located in a TCAM section whose entries are as-  
3        sociated with a current state variable having a first value, and  
4              the next state variable has a second value that differs from the first value, thereby  
5        wherein the next state variable specifies specifying a new TCAM section to be searched.

1        12. (Original) The method of claim 11 wherein each TCAM entry has a match  
2        cell that contains the complete match, the partial match or the mismatch pattern.

1        Claims 13-20. (Canceled)

1        21. (Previously Presented) The method of claim 1 wherein  
2              each regular expression is associated with an action,  
3              the pattern matching engine further includes a second memory device having a  
4        plurality of entries, and  
5              the entries of the second memory device are loaded with the actions associated  
6        with the one or more regular expressions.

1        22. (currently amended) A method for programming a pattern matching engine  
2        having a plurality of information storage entries with one or more regular expressions,  
3        each regular expression including a plurality of characters and having each regular ex-

4 | pression defining a corresponding action to be applied to when matching strings are  
5 | found, the method comprising the steps of:

6 |       including at the pattern matching engine at least one ternary content addressable  
7 |       memory (TCAM) that supports don't care values, the TCAM loaded with the one or more  
8 |       regular expression; and

1 |       including a second memory device having a plurality of entries for loading actions  
2 |       corresponding to the one or more regular expressions wherein each entry of the TCAM  
3 |       identifies a corresponding entry of the second memory device,

4 |       determining that the plurality of sequential characters from more than one sub-  
5 |       expression matches a string, and

6 |       executing the corresponding action associated with that matched string.

7 |

1 |       23. (Previously Presented) The method of claim 22 wherein at least one TCAM  
2 |       entry is associated with a next state variable, the method further comprising the step of  
3 |       loading the entry of the second memory device that is identified by the at least one  
4 |       TCAM entry with the associated next state variable.

1 |       24. (Previously Presented) The method of claim 23 wherein  
2 |       the at least one TCAM entry is located in a TCAM section whose entries are as-  
3 |       sociated with a current state variable having a first value, and  
4 |       the next state variable has a second value that differs from the first value, thereby  
5 |       specifying a new TCAM section to be searched.

1 |       25. (Previously Presented) The method of claim 24 wherein each TCAM entry  
2 |       has a match cell that contains the complete match, the partial match or the mismatch pat-  
3 |       tern.

26. (currently amended) A switchApparatus comprising:

means for programming a pattern matching engine having a plurality of information storage entries with one or more regular expressions, each regular expression including a plurality of characters and each regular expression defining a corresponding action to be applied when matching strings are found ~~having a corresponding action to be applied to matching strings;~~

means for identifying one or more borders within a given regular expression, the one or more borders separating the given regular expression into a plurality of sub-expressions, at least one sub-expression having a plurality of sequential characters; and

means for loading one or more entries of the pattern matching engine with a plurality of the sequential characters from ~~at least~~more than one sub-expression, the entries stored in content addressable memory (CAM),

means for determining if the plurality of sequential characters from more than one sub-expression matches a string, and if so, then

means for executing the corresponding action associated with that matched string.

27. (currently amended) The switch-apparatus of claim 26, further comprising:

means for organizing at least part of the CAM into a plurality of sections, and wherein each section of the CAM is loaded with a plurality of search patterns for a corresponding sub-expression.

28. (currently amended) The apparatusswitch of claim 26, further comprising:

means for associating at least one sub-expression with a current state variable; and means for loading the associated current state variable into each entry of the CAM that contains the at least one sub-expression.

- 1           29. (currently amended) The apparatusswitch of claim 26, further comprising:  
2           means for associating each regular expression with an action;  
3           means for including at the pattern matching engine a memory device having a  
4         plurality of entries;  
5           means for loading the memory device with the actions associated with the one or  
6         more regular expressions.
- 1           30. (currently amended) The apparatusswitch of claim 26, further comprising:  
2           means for using a ternary content addressable memory (TCAM) for the CAM,  
3         each entry of the TCAM identifying a corresponding entry of the memory device.
- 1           31. (currently amended) A switchApparatus comprising:  
2           a pattern matching engine having a plurality of information storage entries con-  
3         figured to program one or more regular expressions, each regular expression including a  
4         plurality of characters and having a corresponding action to be applied to matching  
5         strings;  
6           the pattern matching engine configured to identify one or more borders within a  
7         given regular expression, the one or more borders separating the given regular expression  
8         into a plurality of sub-expressions, at least one sub-expression having a plurality of se-  
9         quential characters; the pattern matching engine configured to determine that the plurality  
10         of sequential characters from more than one sub-expression matches a string, and if there  
11         is a matched string,  
12         then execute the corresponding action associated with that matched string, and  
13         a content addressable memory (CAM), the CAM configured to store a plurality of  
14         the sequential characters from at least one sub-expression.

1      32. (currently amended) The apparatusswitch of claim 31, further comprising:  
2            at least part of the CAM organized into a plurality of sections wherein each sec-  
3            tion is loaded with a plurality of search patterns for a corresponding sub-expression.

1      33. (currently amended) The apparatusswitch of claim 31, further comprising:  
2            the pattern matching engine configured to associate at least one sub-expression  
3            with a current state variable; and  
4            the pattern matching engine configured to store the associated current state vari-  
5            able into each CAM entry that contains the at least one sub-expression.

1      34. (currently amended) The apparatusswitch of claim 31, further comprising:  
2            a memory device having a plurality of entries;  
3            the memory device configured to store actions associated with the one or more  
4            regular expressions.

1      35. (currently amended) The switch-apparatus of claim 31, further comprising:  
2            the CAM configured as a ternary content addressable memory (TCAM), the  
3            TCAM storing a corresponding entry for each entry of the second memory device.